REMARKS

The Examiner's Office Action of December 4, 2002 has been received and its contents reviewed. Applicants would like to thank the Examiner for the consideration given to the above-identified application.

Claims 1-4 and 6-10 are pending in this application, of which claim 1 is independent. By this Amendment, claim 1 has been amended.

Turning now to the detailed Office Action, claims 1-2, 4, and 6-8 stand rejected under 35 U.S.C. §103(a) as unpatentable over Kwong et al. (U.S. Patent No. 5,541,436 - hereafter Kwong) in view of Hao et al. (U.S. Patent No. 6,245,689 – hereafter Hao). Further, claim 3 stands rejected under 35 U.S.C. §103(a) as unpatentable over Kwong in view of Hao and further in view of Lin et al. (U.S. Patent No. 6,127,227 – hereafter Lin; claim 9 stands rejected under 35 U.S.C. §103(a) as unpatentable over Kwong in view of Hao and further in view of Chang et al. (U.S. Patent No. 5,817,562 – hereafter Chang); claim 10 stands rejected under 35 U.S.C. §103(a) as unpatentable over Kwong in view of Hao and further in view of Gupta et al. (U.S. Patent No. 6,391,732 – hereafter Gupta). Applicants respectfully note the above-summarized rejection are treated as obviousness rejection based on the Examiner detailed reasoning, although the Examiner consistently stated that the claims are "anticipated" the cited prior art references.

In view of the amendment set forth above and the arguments provided below, reconsideration and withdrawal of the rejections are respectfully requested.

As amended, claim 1 of the present invention recites a method of fabricating a semiconductor device, the method comprising the steps of: (a) forming a silicon oxynitride film on a silicon substrate; (b) performing a heat treatment while keeping a surface of the silicon oxynitride film in contact with a gas containing nitrogen and oxygen to introduce at least nitrogen into the silicon oxynitride film; (c) after step (b), forming a semiconductor film containing an impurity of first conductivity type on the silicon oxynitride film; (d) after step (c), forming a gate electrode composed of the semiconductor film by patterning the semiconductor film; (e) after step (d), forming a gate insulating film composed of the silicon oxynitride film by patterning the silicon oxynitride film, wherein the gate insulating film has a nitrogen

concentration peak formed at around the center portion of the silicon oxynitride film. Support for the amendment of claim 1 can be found at least in, e.g., lines 15-22, page 7 of the specification and Fig. 7.

Accordingly, since nitrogen is introduced to the silicon oxynitride film, which composes the gate insulating film, by performing a heat treatment while keeping in contact with a gas containing nitrogen and oxygen, the nitrogen concentration peaks at around the center portion of the silicon oxynitride film and a steep distribution of concentration can be achieved. By using this silicon oxynitride film as the gate insulating film, the decreasing of the threshold voltage can be prevented, and a transistor having an excellent ON-OFF characteristic and a high driving force can be formed.

Kwong teaches, as shown in Figs. 1-2, a method of fabricating a semiconductor device including a step of forming a silicon oxynitride film 20 using N_2O gas on a substrate, and thereafter performing a heat treatment in a NH_3 ambient for nitriding the silicon oxynitride film. Hence, Kwong fails to disclose introducing nitrogen into the silicon oxynitride film using a gas containing nitrogen and oxygen, such as recited in claim 1 of the present invention. Should the Examiner still maintain that Kwong discloses introducing nitrogen into the silicon oxynitride film using a gas containing nitrogen and oxygen, Applicants respectfully would request the Examiner to point out the specific text in Kwong for support of his assertion.

Hao teaches, as shown in Figs. 2A and 2B, forming an oxynitride layer 10 on a surface 11 of a substrate 8 by annealing using NO and N_2O gases. Further, in the oxynitride layer 10, a surface region 14 has a nitrogen concentration surface peak 22 and an interface region 16 has a nitrogen concentration surface peak 24. Hence, the oxynitride layer 10 has two nitrogen concentration peaks, each at the surface 11 and the upper surface 12, but not around the center of the oxynitride layer 10. Hence, Hao fails to disclose the nitrogen concentration peak formed at around the center portion of the silicon oxynitride film, such as recited in amended claim 1 of the present invention.

Applicants respectfully assert that, as Kwong fails to disclose discloses introducing nitrogen into the silicon oxynitride film using a gas containing nitrogen and oxygen, Kwong

therefore also fails to disclose the nitrogen concentration peak formed at around the center portion of the silicon oxynitride film.

Further, as Hao and Kwong fail to disclose the nitrogen concentration peak formed at around the center portion of the silicon oxynitride film, as recited in amended claim 1, these cited prior art references are deficient and cannot be combined in a §103(a) rejection.

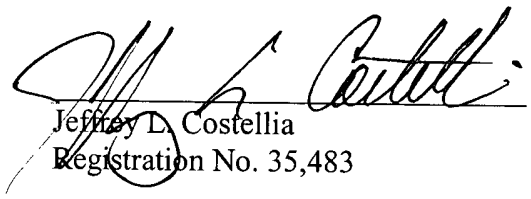
The requirements for establishing a *prima facie* case of obviousness, as detailed in MPEP § 2143 - 2143.03 (pages 2100-122 - 2100-136), are: first, there must be some suggestion or motivation, either in the reference themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference to combine the teachings; second, there must be a reasonable expectation of success; and, finally, the prior art reference (or references when combined) must teach or suggest all of the claim limitations. As Kwong and Hao are deficient, as set forth above, their combination in a §103(a) rejection if independent claim 1 would be improper.

With respect to the §103(a) rejection of claims 2, 3, 4, 6-10, which are based on Kwong, Hao, and other secondary references, the arguments set forth above in relation to the rejection of claim 1 are also applicable.

In view of the amendment and arguments set forth above, Applicants respectfully request reconsideration and withdrawal of all pending §103(a) rejections.

While the present application is now believed to be in condition for allowance, should the Examiner find some issue to remain unresolved, or should any new issues arise, which could be eliminated through discussions with applicants' representative, then the Examiner is invited to contact the undersigned by telephone in order that the further prosecution of this application can thereby be expedited.

Respectfully submitted,



Jeffrey L. Costellia
Registration No. 35,483

NIXON PEABODY LLP
8180 Greensboro Drive, Suite 800
McLean, VA 22102
(703) 770-9300

MARKED UP VERSION

1. (Twice Amended) A method of fabricating a semiconductor device, the method comprising the steps of:

(a) forming a silicon oxynitride film on a silicon substrate;

(b) performing a heat treatment while keeping a surface of the silicon oxynitride film in contact with a gas containing nitrogen and oxygen to introduce at least nitrogen into the silicon oxynitride film;

(c) after step (b), forming a semiconductor film containing an impurity of first conductivity type on the silicon oxynitride film;

(d) after step (c), forming a gate electrode composed of the semiconductor film by patterning the semiconductor film;

(e) after step (d), forming a gate insulating film composed of the silicon oxynitride film by patterning the silicon oxynitride film,

wherein the gate insulating film has a nitrogen concentration peak formed at around the center portion of the silicon oxynitride film.